



INSTRUCTIONS

COMPRESSED AIR EQUIPMENT

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INTRODUCTION

This section covers the Gardner-Denver Types WBO and WBG Air Compressor. The air compressor, during normal locomotive operation, supplies the high-pressure air needed for the air brake system.

AIR COMPRESSOR (Gardner-Denver Types WBO and WBG)

DESCRIPTION

This instruction applies to three or six-cylinder, two-stage, water-cooled air compressors. The low-pressure cylinders are mounted at an angle on each side of the machine, and the high-pressure cylinders are mounted vertically in the center of the machine. One air suction valve and one discharge valve are located in the head over each cylinder bore. A water-cooled intercooler is provided to cool the air as it passes from the low-pressure to the high-pressure cylinders, Fig. VII-1.

INSPECTION AND LUBRICATION

General

Oil level in the crankcase must be maintained in the RUN ZONE on the oil level gage. Add oil as required to maintain the correct level.

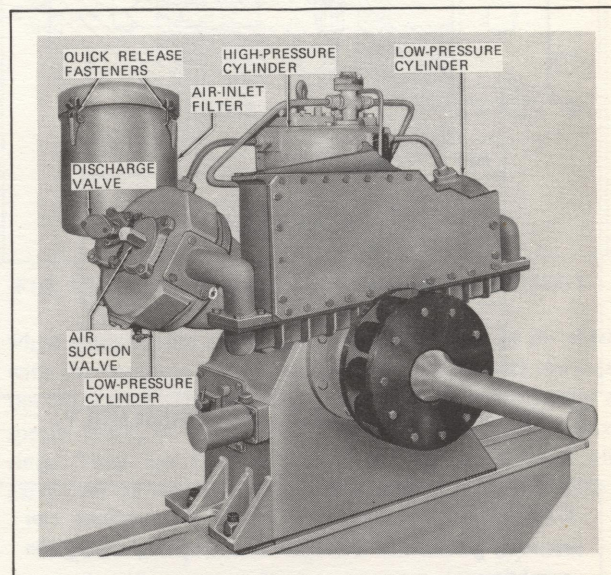


FIG. VII-1. GARDNER-DENVER AIR COMPRESSOR, TYPICAL (SHOWN UNDER ASSEMBLY).

Oil pressure should be set 18-20 psig at engine idle (450 rpm), when the compressor lube oil is at 140 F. Oil pressure is controlled by an oil-relief valve mounted on the side of the crankcase at the intercooler end, Fig. VII-2. Oil pressure is adjusted by adding or removing shims beneath the pressure-adjusting cap on the oil-relief valve (adding shims reduces pressure).

Thoroughly clean the crankcase each time the oil is changed. Dirt and sludge, if left in the crankcase, will be picked up by the pump; if allowed to accumulate, will eventually plug the pump section. Thereby, lubrication will be obstructed and possible damage to moving parts will result.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

Verify numbers for parts, tools, or material by using the Renewal Parts or Tool Catalogs, or contact your General Electric representative for assistance. Do not order from this publication.

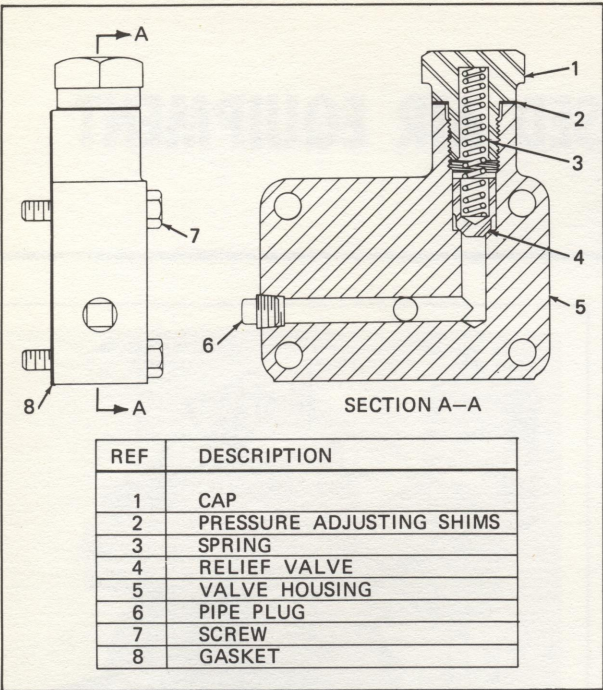


FIG. VII-2. OIL RELIEF VALVE ASSEMBLY.

CAUTION: An explosion inside the machine can occur if gasoline or kerosene is used for cleaning the crankcase.

Use a regular flushing oil and wipe out the crankcase with clean, lint-free cloths.

INTERCOOLER

Drain the condensate from the intercooler through the drain valves in the bottom of the shell.

Operate the intercooler safety valve to be sure it functions properly. Note the intercooler gage pressure (when provided) while the compressor is operating. Normal operating pressure should be approximately 45 psig for WBO, and 35 psig for WBG.

The safety valve used on both machines is set for 65 psig. A defective high-pressure suction and/or discharge valve may cause the safety valve to "pop" continuously. Check safety valve for correct opening pressure. If the popping persists, refer to Table VII-II for corrective action.

ORIFICE TEST (Per DOT Regulations)

On Locomotive

1. Use an accurate air gage and an orifice holder with an orifice bored through a 1/16-in. thick plate; leave edges square (see Table VII-I). Place the orifice and gage in the drain cock of the reservoir farthest from the compressor. Refer to Table VII-I for correct orifice.
2. Run the compressor until normal working temperature is indicated.

TABLE VII-I, ORIFICE TESTING
RESERVOIR PRESSURES (PSIG) AT VARIOUS ALTITUDES

	rpm	0	1000	2000	3000	4000	5000	6000	7000	8000
New or Repaired Compressor	450	63	60	58	55	53	50	48	45	43
	550	77	74	70	68	65	61	58	55	52
	650	91	87	83	80	76	72	69	65	62
	750	105	101	96	92	88	83	79	76	71
	850	120	115	110	105	100	95	91	85	81
	950	134	128	123	118	112	107	102	96	91
	1050	147	140	135	130	124	119	112	107	101
Condemning Limit	450	54	52	49	47	45	43	41	39	37
	550	66	64	61	58	55	53	50	48	45
	650	79	76	73	69	66	63	60	57	54
	750	92	88	83	80	79	73	69	66	63
	850	104	100	96	92	88	83	79	75	71
	950	117	113	108	104	98	94	89	84	79
	1050	129	125	120	115	110	105	100	95	90
WBO, 7-7/8 in. and 5-3/4 in. x 5 in., three cylinder – Use orifice 0.28125 (9/32) in. in 1/16 in. plate.										
WBG, 7 in. and 5-3/4 in. x 5 in., six cylinder – Use orifice 0.359 (23/64) in. in 1/16 in. plate.										

FIG. VII-2, E-15087A

3. Open the reservoir drain cock in which the orifice is installed.
4. Run the compressor for two minutes; then, take and record a speed-pressure reading for the points on the chart in Table VII-I.
5. Run the compressor for 15 minutes; then, repeat Step 4.
6. Compare the speed-pressure readings with the data in Table VII-I. If the points fall below the condemning limit curve, remove and overhaul the compressor.

REPAIRING COMPRESSOR ON LOCOMOTIVE

If general repairs are necessary, repair the compressor without removing it from the locomotive if possible. Exercise care to assure cleanliness when any part is removed from the compressor.

When an orifice test of the compressor indicates the actual delivery of air is below the required minimum, this condition may be traceable to defective valves, worn piston rings or worn cylinders. The valves should be examined and, if necessary, replaced. If heavy carbon formation is present around the valves, the heads should be removed for thorough cleaning. Should the compressor still fail to meet requirements of the orifice test, the cylinders and pistons should be removed.

While the cylinders and pistons are thus removed, the crankcase oil should be drained and the crankcase cleaned and washed with an approved solvent to remove all sludge deposits.

WARNING: Solvents may be toxic or flammable and cause harmful or fatal injury. Use only with adequate ventilation, avoid contact with skin, avoid inhalation of fumes and do not expose to flame or sparks.

After the compressor is completely reassembled and before it is released for service, fill the crankcase to the proper level with recommended lubricating oil.

The cylinders and pistons removed from the compressor should be reconditioned for future use.

When ring removal is necessary, the old rings should be discarded and replaced with new ones. To insure the rings are installed with the minimum possibility of damage, a ring installation tool should be used. As an alternate, use thin, narrow strips of metal to bridge the vacant ring grooves

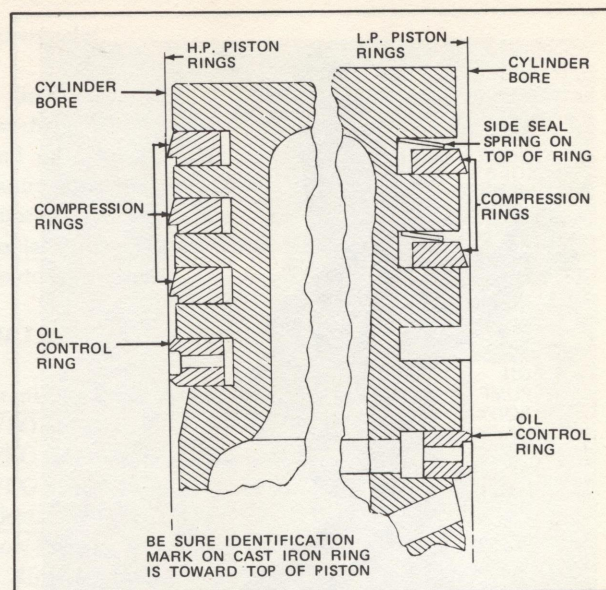


FIG. VII-3. PROPER PISTON RING ARRANGEMENT.

when applying the rings. Taper-face rings must be installed with the scraping edges arranged to force the oil towards the crankshaft. The side that goes up can be identified by a special mark, or word "TOP." Do not apply straight-face rings. They are slow in seating and do not control oil carry-over as well as the original-equipped taper-face type.

NOTE: Compression rings are marked on top with an identification mark to insure proper application, Fig. VII-3. The oil control rings are not marked, as they may be applied with either side up.

On the low-pressure piston, the compression rings with side seal springs are applied to the first two top grooves. The third groove is left open. The side seal spring is always above the ring.

Oil control rings are always in the bottom groove of the piston.

NOTE: For air compressor shaft alignment, refer to the Mechanical Equipment section of this composite manual.

Oil Pump

Plunger Type

The oil pump should fit the crankshaft to the limits listed in the Data section. If the clearance limit is exceeded, a new oil pump eccentric will be required. The plunger-type oil pump should be inspected for scoring and excessive wear. If the clearance limit is exceeded as given in the Data section, a new pump assembly should be installed.

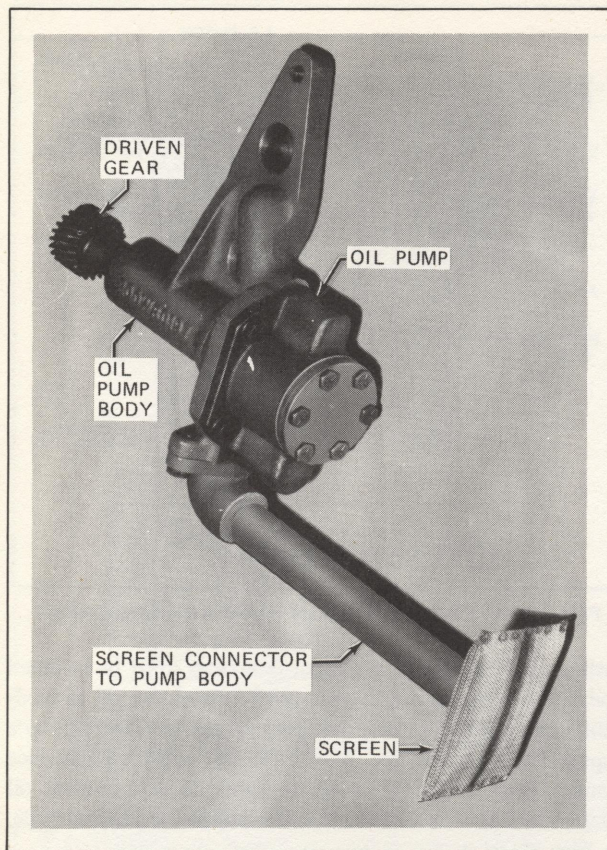


FIG. VII-4. NEW GEAR TYPE LUBE PUMP (STARTING WITH WBG-9510 AND WBO-9516).

Gear Type (See Figs. VII-4 and VII-5)

The condition of the pump can be determined best by removing the head plate and checking the internal parts for excessive wear. End clearance is set by adding or removing plastic gaskets until the pump shaft can be rotated freely by hand.

The lube-pump drive shaft end-play should be between 0.001 and 0.004 in. Push tapered roller bearing on tang end of shaft up with adjusting nut until shaft end-play is within limits. Advance adjusting nut to next locking position and secure with locking washer. Refer to Fig. VII-6 for internal clearances.

Lube Oil Filter

Take oil pressure readings at the two tapped openings on the side of the oil-relief valve body. When a difference of 14 psig in the two readings is reached at engine idle (450 rpm), replace the filter.

Oil-Pressure Relief Valve

The oil-pressure relief valve should be completely disassembled, thoroughly cleaned and inspected. All

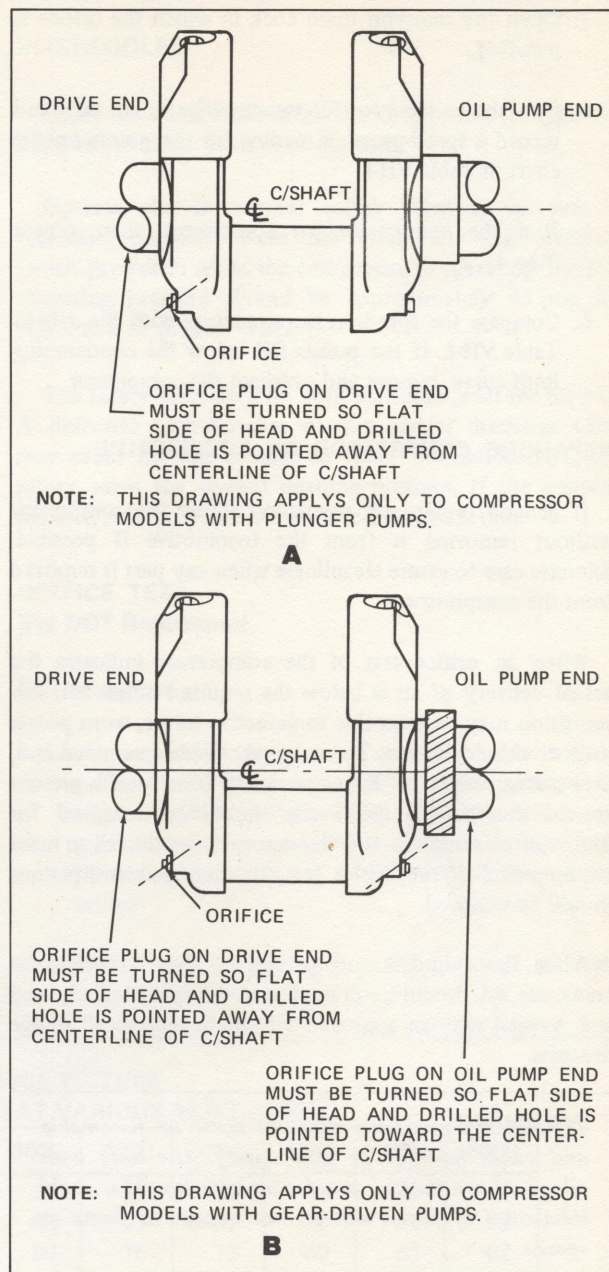


FIG. VII-5. CRANKSHAFT ORIFICE PLUG ARRANGEMENT.

passages should be blown out, using compressed air. The valve should then be reassembled. Reset after installation on compressor.

WARNING: When using compressed air for cleaning purposes, an environment potentially hazardous to personnel in the immediate area is created. To prevent physical injury by flying debris, observe all Railroad and OSHA safety regulations.

FIG. VII-4, E-21088

FIG. VII-5, E-21090

Intercooler

Intercoolers should be removed when compressor is overhauled for cleaning inside and out. Accumulated dirt and oil residue should be removed from air passages to assure maximum efficiency. Back plate should be disassembled to clean cooling water passages to assure full coolant flow. These passages will become plugged with long service operation.

DATA

Crankcase Capacity (gal.)

WBO Series 10-1/2

WBG Series (Small Crankcase) 3-1/2

WBG Series (Large Crankcase) 17-1/2

Clearances (in.)

Low-Pressure Cylinder, Oil Control

Ring Gap (Min.) 0.008

Low-Pressure Cylinder, Piston to

Cylinder (Min.) 0.0035

High-Pressure Cylinder, Oil Control

Ring Gap (Min.) 0.006

High-Pressure Cylinder, Piston to

Cylinder (Min.) 0.003

Connecting-Rod Bearing to Crankpin

Diameter Clearance (Min.) 0.0012

Connecting-Rod Side Clearance

(Total for Three Rods) (Min.) 0.013

Piston Pin to Bushing Clearance (Min.)* 0.001

Oil Pump Eccentric to the Crankshaft

Minimum 0.001

Maximum 0.003

Oil-Pump Plunger to Oil-Pump Body Clearance

Minimum 0.001

Maximum 0.003

Main Bearings End Clearance (Cold)

WBO 0.008-0.010

WBG 0.010-0.012

TROUBLE-SHOOTING

The intercooler is an important part of a compressor and should receive special attention during inspection and maintenance. In a two-stage compressor, the air drawn into the cylinders of the low-pressure stage is heated by compression and forced into the intercooler at a pressure of approximately 35 to 45 pounds. The intercooler then removes a large portion of this heat before the air enters the high-pressure stage.

Whenever it is necessary to determine if a valve is faulty, begin by checking at the intercooler, Table VII-II.

*Current units have caged roller bearings in high pressure pistons.

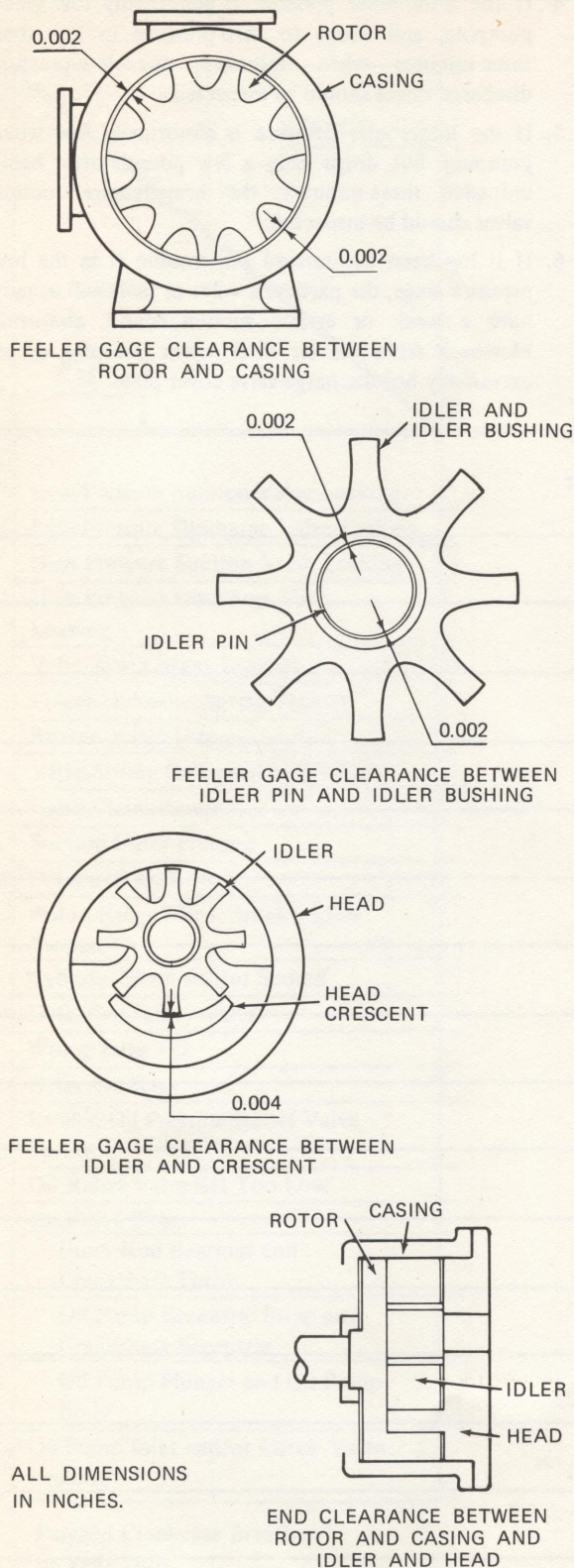


FIG. VII-6. GEAR TYPE LUBE PUMP
INTERNAL CLEARANCES.

Considerable time can be saved by using the following procedure for locating a defective valve:

1. Remove pipe plug in intercooler and apply a 0-75 psi air gage.
2. If the intercooler pressure is abnormally high ONLY when pumping, inspect the high-pressure suction and discharge valves.
3. If the intercooler pressure increases slowly when unloaded, check the high-pressure discharge valves or high-pressure suction unloading mechanism.
- 4., If the intercooler pressure is abnormally low when pumping, and drops to zero pressure in less than three minutes when unloaded, the low-pressure discharge valves should be inspected.
5. If the intercooler pressure is abnormally low when pumping, but drops only a few pounds after being unloaded three minutes, the low-pressure suction valves should be inspected.
6. If it has been determined the trouble is in the low pressure stage, the particular valve at fault will usually have a weak or erratic suction sound, abnormal blowback from the air filter when pumping or an excessively hot discharge-valve cover plate.

NOTES:

TABLE VII-II, TROUBLE-SHOOTING

CAUSE \ EFFECT	Higher Than Normal Inter-Cooler Pressure (Loaded)	Higher Than Normal Inter-Cooler Pressure (Un-Loaded)	Lower Than Normal Inter-Cooler Pressure (Loaded)	Inter-Cooler Pressure Drops To Zero (Un-Loaded)	Inter-Cooler Pressure Rises (Compressor Stopped and Un-Loaded and Pressure In Main Reservoir)	Compressor won't Pass Orifice Test	Excessive Carbon Build-Up On Valves	Abnormal Valve Opening Cycle &
Low Pressure Suction Valve Leaking			•			•		
Low Pressure Discharge Valve Leaking			•	•		•		
High Pressure Suction Valve Leaking	•					•		
High Pressure Discharge Valve Leaking	•	•			•	•		
Valve Seat Gasket Leaking	•	•	•	•		•		
Lower Unloader Spring Broken								
Broken Valve Disc	•	•	•	•		•		
Valve Spring Collapsed or Broken	•							
Valve Clamp Loose								
Suction Filter Plugged			•			•		
Defective Air Filter							•	
Piston Rings Worn, Stuck and/or Broken						•	•	
Cylinder Worn and/or Scored						•	•	
Defective Safety Valve								
Wrong Lube Oil							•	
Defective Gage								
Broken Oil Pressure Relief Valve Spring								
Oil Relief Valve Set Too Low								
Excessive Wear:								
Conn Rod Bearings and Crankshaft Throw								
Oil Pump Eccentric Strap and Crankshaft Eccentric								
Oil Pump Plunger and Oil Pump Body								
Oil Pump Inlet and/or Check Valve Leaking								
Plugged Crankcase Breather or Vent Tube								

Effect: 1. Pressure Build-up in Crankcase
 2. Oil Seal Leaks

TABLE VII-II, TROUBLE-SHOOTING

	Inter-Cooler Pressure Drops To Zero (Un-Loaded)	Inter-Cooler Pressure Rises (Compressor Stopped and Un-Loaded and Pressure In Main Reservoir)	Compressor won't Pass Orifice Test	Excessive Carbon Build-Up On Valves	Abnormal Wear Of Valve Components Cylinders, & Rings	Piston Rings Plugged and/or Stuck In Grooves	Noisy Valve	Disc Breakage	Low Oil Pressure Indication	Excessive Blow Back Through Suction Filter (Loaded)	Inter-Cooler Safety Valve Pops
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- 1. Pressure Build-up in Crankcase
- 2. Oil Seal Leaks

VII